

EMERGENCE OF CONVERGED SERVICE AND PARADIGM CHANGE IN COMMUNICATION REGULATION

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Introduction

Broadcasting communication and media environment is entering into Hyper Connected Society where everything is connected and communicates with each other based on 5G. In Hyper Connected Society, based on ICT technologies such as machine to machine (M2M), Internet of Things (IoT), and Internet of Everything (IoE), intellectualized network are created where people, process, data, and things are connected to each other. Additionally, innovative service (future converged service) based on such ICT technologies is expected to be provided in various ways.

The current legal system of Korea, however, is not equipped with the system of putting together future converged communication services. The current Telecommunication Business Act employs the general and abstract regulatory system that focuses on user protection according to the provision and use of network by categorizing telecommunication businesses based on network construction method. Especially, the main purpose of the Act is detailed regulation of key telecommunications service provider on the premise of large scale construction of electric telecommunication line. This exposes the limits of the Act on detailed regulation of new types of electric telecommunication service created by sophistication and lightening of installation due to technological innovation.

In addition, practical and flexible regulation was rendered difficult because the regulatory contents and methods on particular actions of key telecommunications service providers, as well as special category telecommunications operators and value added common carrier, are outdated. Moreover, the regulatory basis for the Act does not exist to regulate new types of behaviors by converged and complex service businesses that hamper user interest, including illegal or law-evading behaviors that have negative effects on the consumers and the fair competition of the telecommunication market.¹

An even more serious problem is the fragmentary actions taken whenever a new service appears without a comprehensive and inclusive legal system for future converged communication service. In other words, although a general law on electronic communication service exists, partial and fragmented actions are taken via enactment and revision of individual and separated laws whenever a new type of future converged communication service is created.

Therefore, a critical political task exists for establishing general regulatory system for various types of future converged communication service, especially as the paradigm of future communication is changing. Additionally, the need for re-establishing the position of the Telecommunication Business Act is the general law about electronic communication service.

Not only in terms of legal system, also for users, consistent legal system for future converged communication service is essential. As the Hyper Connected Society beyond the time and spatial boundaries has arrived, in principal, the consumer can use various future converged communication services whenever, wherever. Thus, the related legal system must guarantee the right of choice of the users according to the future converged communication service environment that is user-oriented. It also must create the legal system that focuses on users in order to ensure non-discriminatory treatment of users.

Moreover, for the national competitiveness, anticipatory action strategies for future converged communication service are required. Currently, the trend of future converged communication service has the hegemony where global businesses beyond national business, regulation, and policy shape the environment of global future converged communication service, which creates difficulties for national future converged communication service providers and businesses to have competitiveness. Accordingly, it is an urgent task to prepare anticipatory action strategies in order to secure global competitiveness by extracting and analyzing main issues and trends of future converged communication service.

Based on such consideration, this study aims to suggest an effective legal system that can encompass related services as new communication service appears based on ICT. In doing so, this study 1) analyzes trends in future converged communication service and defines related concepts, 2) examines major and relevant issues. In conclusion, it is expected that this study will suggest the direction of improvement the Telecommunication Business Act may take that focuses on protection of users and in terms of national policies.

¹ Under the current Telecommunication Business Act, general entry and expulsion regulations are defined for special category of

Analysis of Main Concepts and Trends in Converged Service

A. Internet of Things (IoT)

Internet of Things (IoT), first suggested by Kevin Ashton, the Manager of Auto-ID Center of MIT in 1999, still does not have a standard definition of the term, because the technical and theoretical discussion on IoT is at its initial stage (Internet Information Journal, 2014). In general, IoT means the environment where information produced by sensors installed on things is shared on the network. Casagras² of EU, an international cooperation research related to RFID, defines IoT as “global network infra that connects physical and virtual objects utilizing the usability of data capture and communication function.” CERP (Cluster of European Research Project) summarized IoT as “a part of the combined future Internet and a global network infra that is dynamic and with standard or mutual communication protocol with physical or virtual identifier, physical form and intelligence, and automated construct function.” According to International Information Journal (2014), “IoT is composed of network of the communication between logical objects and other objects, which then expands into communications network like the traditional Internet. IoT is a general term for proactively interacting technologies with intellectual interface and for technologies that aim to provide service with the optimum user value by binding and connecting, as one frame, the network between devices with intellectual capacity such as learning skill with gigantic web like the Internet.” On the other hand, according to Korea Internet & Security Agency (2013), IoT means “object space network that creates intellectual relationships such as mutually cooperative sensing, networking, and information processing, without the help of a human being by three, divided elements of environment: human, object, and service.”

Thus, IoT includes mobile, sensor network, contents, and NFC. IoT has a broader meaning than the traditional M2M and a narrower meaning than IoE (cloud, big data, and connect car).

IoT is at the center of attention as the essential technology and as the backbone of creating Hyper Connected Society with an industry-wide impact in the future due to the exponential increase in the number of inter-connected devices.

The expansion of connected device³ and developments in sensing technology contributed to the rapid expansion of IoT, which is referred to as the technology with significant influence on the market within 5 years (Joo & Kim, 2014; Gartner, 2012). According to Gartner (2015), 6.4 billion things will be connected to the Internet worldwide by 2016 with 5.5 million things are being connected newly to the Internet every day. The number is a 30% increase from 2015 and it is expected to increase to 20.8 billion things in 2020.

The IoT service in Korea is at its initial stage. Logistics tracking, remote testing service, and public service are general services provided centering on mobile communication companies and the area is expanding into the consumer market recently. The IoT service in Korea has started to expand with the creation of the IoT Intelligence Communication Infrastructure Establishment Plan in 2009 and of the RFID/USN basis in 2008. Moreover, in the private sector, a mobile communication company led the development of IoT platform and has been providing related service including “Thing Plug” of SKT, “GiGA IoT Home Manager” by KT, and “IoT@home” by LG. SKT focuses on capturing the ecosystem and creation of network called “Lora” or the “Internet of Small Things.” On the other hand, KT and LGU+ focuses on establishing IoT communication network that utilizes LTE network (Lee, 2016).

Ministry of Science, ICT and Future Planning (2016) estimated that the sales account of IoT service will increase a 10.9% to 5 trillion 300 billion KRW in 2016 from about 4 trillion 800 billion in 2015, which is a 28% increase from 2014. To compare between service sectors, personalization service (smart car, smart home, and health care) showed the highest percentage of sales account (31%), followed by payment (19.5%) and society/culture (8.5%). It is also expected that the personalization service sector will be most active, while the sectors such as health/medical and automation/safety service will also experience growth.

B. Social Network Service (SNS)

By definition, SNS refers to online human-network creating service in general. SNS includes web-based service that allows seeing human-network list created by other people’s accounts, categorizes lists of other users in network, and creates public profiles of individuals. SNS is a combination of web 2.0 platform based web application service, where web 2.0 platform is based on interactivity and openness as the technical ideology, and a general term for web services that enable communication behaviors combining social interaction and multimedia elements by using two-way technology. Following the evolution of service, academic and technical definitions of SNS are ever expanding – for instance, recently, it covers profile-based personal media, micro-blog, video blog, and virtual reality.

SNS realized and specified the basic ideas of the Internet such as dispersive network, openness, sharing attribute, and participation. The mechanism of creating and spreading contents via user interaction and relationship is a part of SNS, which provides five basic functions (relationship creation, profile management, communication, contents creation, and network utilization). Due to the spread of smart phones and proliferation of mobile SNS, as well as the information transmissibility of SNS that

² European Union is proceeding with Casagras, an international co-research project related to RFID as a part of the Seventh Framework Program (FP7) that aims to recover competitiveness of the telecommunication industry.

³ Connected Device refers to a portable device that provides new service by being connected to the wireless network such as WLAN or 3G.

transmits information quickly through personal networks and transportability of smart devices, SNS is becoming the media of a great ripple effect. Recently, SNS is also being used as the platform where various types of contents can be distributed and shared, including UCC (User Created Contents) and music, based on personal networks.

We Are Social (2016) reported that about 2.3 billion people worldwide are using SNS as of January of 2016, which accounts to 31% of the world's total population and is a 10% increase from the year before. Among them, about 1.97 billion people used SNS with a mobile device. In addition, Facebook had 1.59 billion active users, which put Facebook at the top in terms of market share.

Social advertisement is a service that delivers personally chosen or targeted advertisements based on profile data and social network to the users of social network, and it is becoming the major source of sales for SNS business in recent years.

On the other hand, social TV means a service that allows sharing of information and opinions about TV shows on SNS. Social TV refers to the connectible function of TV sets to SNS provided by TV manufacturers or the second screen function for using SNS provided by pay TV services for their

customers. In Korea, about 72% of TV viewers concurrently use SNS while watching TV programs, which, in the long term, creates the expectation of the initiation and expansion of various converged services that combine SNS with TV.

Social game is online gaming based on social network that promotes human networking and bonding between users based on SNS platforms. For example, „Annipang“, a social gaming service by Kakaotalk, produced 0.2 billion KRW of daily sales, while „Dragon Flight“ showed daily sales of 2 billion KRW. Accordingly, social games capture significant amount of SNS sales next to social advertising.

C. Laws and Issues related to ICT-based Converge Service

i. Regulatory Systems of Major Countries on Communication Service

1. Regulatory Systems of Major Countries on Communication Service

A. United States

United States overhauled the old Telecommunication Act of 1934 in 1996. The change aimed to introduce the market principle through deregulation for the era of media convergence.

Title	Contents
I. General Provisions	General Rules, Definitions, Authority of FCC, etc.
II. Common Carriers	Wire communication, Telephone Servicers
III. Provisions relating to Radio	Wireless communication, Telephone Servicers, Broadcasting Businesses, etc.
IV. Procedural and Administrative Provisions	Regulatory Process and Powers of FCC
V. Penal Provisions-Forfeitures	Penalties and Forfeit Regulations
VI. Cable communications	Cable service and servicers
VII. Miscellaneous provisions	Miscellaneous

Table 1 Structure of Telecommunication Act of U.S.

Under Title I, the purpose of the Telecommunication Act, establishment of FCC, organization, functions and related regulations, fees and innovations made about regulations are stated. Title II deals with common carrier and is constituted three Parts: (1) common carrier regulations, (2) development of competitive market, and (3) special regulations on bell operators. Part I, where regulations on common carrier are defined, regulates, in particular, the authority of FCC on charges, liability of carriers, bell company specific rules, protection of consumer information, obscene or nuisance calls, shared use of cable lines, communication service for people with disabilities, telephone exchange service, blocking and protecting from obscene communication material. In Part II, the section on development of competitive market, rules on mutual connect, negotiation of agreements, mediation and authorization process, and shared use of infrastructure are stated. In Part III, the special regulations on bell operators, rules on the entry of bell operators, facility production and electronic

publishing, warning surveillance service, and provision of public phones are promulgated.

The Title III on wireless communication also has five subparts, including the general rules, operation of radio stations and radio equipment of ships, radio installation of commercial ships, support on public communication facilities, pilot projects of communication, and public media companies. Under the General rules, radio communications and energy transfer license, intermeddling with radio reception, general powers of FCC, government-owned radio stations, foreign ships, special requirements for media service applications, administrative system, application of competition laws, protection of market competition, in-advance announcement for particular broadcasting, operation of sending set, building authorization, and mutual communication between mobile communication. In Part II, operation of radio equipment and stations of ships, technical requirements, life mobile stations, installment authorization, and control of FCC, automated ship

distress, and safety system are defined. In Part III, the requirements and waiver on radio telephone equipment for commercial liners and the waiver by FCC are stated. On the other hand, Part IV states support on public communication facilities, communication pilot business, announcement on the purpose of public media companies, subsidy for construction and planning, establishment of national fund and support on pilot projects.

In terms of Title IV, where process and administrative regulations are promulgated, the jurisdiction in terms of enforcing laws and orders of FCC, facility provision orders, general requirements regarding process, utilization of committee, and joint litigation. In Title V on penalty issues, general penalties and violation of regulations and orders, jurisdiction on violations, fines, prohibited behaviors for knowledge, technology, and opportunity competition, and forfeiture of communication facilities.

In relation to cable communication in Title VI, there are 6 subparts. Under Part I, the General Rules define the purpose and definitions. In Part II, use of cable channels, limitations on cable ownership, regional and commercial TV signal transmission, nonprofit educational TV transmission, regulations on transmission agreement, and sales of cable system are specified. In Part III, regulations on franchising are clearly written. Included provisions deal with general requirements for franchising, charges of franchise and regulations, service facility and equipment regulation. Under Part IV, Miscellaneous Rules, privacy protection

Category	Telecommunication Service	Information Service
Duty	Duties include Common Carrier's duty of connection fee, common service, public safety,	No duty same as Common Carrier.
Service Regions	Intra-state service	Inter-state service
Regulation & Supervision	Regulated by state governments. Supervised by the Federal Government.	Only supervised by the Federal Government. No regulation by state governments.

Table 2 Comparison between Telecommunication Service and Information Service in US [47U.S.C153] Definitions (20) Information service, (46) Telecommunication services

Accordingly, in 1999, a new regulatory framework for electronic communication network and service has been pronounced. In 2000, in addition, after considering collected opinions on existing reviews, five special guidelines, including the regulatory framework containing regulatory directions on electronic communication network and service, have been published.

On the other hand, there are five directives on Competition, Authorization, Access and Interconnection, Universal service, and Data Protection. The details are summarized in the table below.

In essence, the regulatory framework of EU is a dual system of contents and transmission level, which is vertical and divided into ground wave media, cable, satellite business, and communication service from the traditional area of media and communication. This means that the regulatory framework of EU is horizontal and takes the principle of same regulation for the same level without considering the specific type of a business.

for members, consumer protection and consumer service, equal employment opportunity, legal proceedings, limitations on liability of franchise authorities, control of federal, state, and regional authorities, civil and criminal liabilities, and rules on obscene programs are defined. Part V regulates video program service provided by telephone companies.

In addition, with the revision, the original category of business under the old Telecommunication Act – i.e., service provider (Common Carrier), information service, telecommunication, telecommunication service – is revised to two categories – i.e., „telecommunication service” and „information service” – while only the telecommunication service is covered under the same Act's second version.

⁴ In detail, telecommunication service is defined as providing telecommunication at a cost directly to the public or to each user per a different level for effective direct provision. On the other hand, information service is defined as enabling creation, acquisition, storage, modification, and process of information through communication and includes electronic publication, although it does not include the use of capacity for management or operation of communication service or system.

B. European Union

European Union (EU) has established EU regulations mainly as guidelines so each nation can employ such guidelines into its own national laws based on the determination by national legislatures.

In terms of transmission level regulations, the regulatory purpose is promotion of competition. At the transmission level, the regulations apply to every type of electronic communication service including the transmission service utilizing ground wave media, cable, satellite business, and communication service.

On the other hand, in terms of regulations on the contents level, Audio-visual Media Services

Directive is the law, not the five special directives, Television Without Frontiers Directive (TVWF) or the regulatory framework. Such directives mainly focus on regulating visual contents.

There was a determination that the old TVWF had limits in embracing changes in the industry caused by development of new cutting-edge technologies. Thus, Audio-visual Media Services Directive was enacted in which the basic purpose of ensuring public interest by promoting social, cultural, and linguistic diversity. Moreover, the importance of job creation and economic development

via vitalization of investment in the on-demand audio visual media service field is also being emphasized.

In conclusion, the EU directives have the typical horizontal regulatory framework, meaning that they are proper for the converged environment.

Still, because, in practice, the contents transmission is not always nondiscriminatory and immediate, the issue of the relationship between different levels has been extended to the discussion on network neutrality (Broadcasting Communication Commerce Center, 2009).

Directives	Main Contents
Competition	While individual license is abolished, general authorization has been introduced (with only notification, business can operate. Commonly applied to media and communication) Minimization of duties and nondiscriminatory approach
Authorization	Approach about network or related facilities. Rights and duties of providers are identified to benefit consumers and for mutual operation.
Universal service	Establishing users "rights of service. Providers" duties. Maintaining universal service fulfills the minimization principle of market distortion.
Competition	Abolition of exclusive and exceptional right for electronic communication network and service. Right to use frequency granted based on objectivity, nondiscrimination, transparency, and proportionality.
Data Protection	Protection of basic rights and freedom at equal level like privacy.

Table 3 Special Directives on Communication of EU

C. Law of Communication and Establishment of OFCOM in the UK

In the UK, an integrated regulatory entity, OFCOM, was established in December 2003, after the discussion on combining dispersed regulatory and political entities of media and communication in order to answer the trend of convergence between media and communication. OFCOM combines the functions of five different entities – OFTEL, ITC, BSC, RA, and Rau – and simplified the regulatory structure. Regulatory tasks are given to the policy enforcement unit of OFCOM, which is composed of strategy and market development group, competition and market group, and contents and standard group. Whenever different issues conflict with each other, internal agreement and mediation take place (Kwak, 2001).

Under the traditional system, media law and communication law were separated. Since 2000, however, as a result of discussion on establishing regulatory system proper for the converged era of media and communication, the Communication Law has been enacted. Under the Communication Law of 2003, rules on the composition of OFCOM and implication of various regulations on media business are included. Cross-ownership between different types of media, non-European foreign investment, authorizing sale of radio frequencies are main contents of the law. The Communication Law of 2003 is composed of six chapters and 411 articles. Under Chapter 1, the composition and functions of OFCOM are defined. Chapter 2 states regulations on Electronic Communications Network, Electronic Communications Service, and associated facility by suggesting a single regulatory

framework. Under Chapter 3, regulations on TV, radio, and contents are promulgated (Lee, 2004).

Under the Communication Law of 2003, "service" is categorized into electronic communication service, contents service, and broadcasting service. It is noteworthy that the term, electronic service, has chosen the new categorizing method that is network and contents oriented at the legal stage by combining concepts that were used to be divided between broadcasting and communication. Without regards to the type of contents provided, every network used for contents transmission falls under a single concept, while the substance of contents is separately categorized and regulated (Lee, 2004).

Implications

The ICT environment changes rapidly while the beginning of new converged services is making the future ever unpredictable. Accordingly, the inevitable need of modifying, reinterpreting, or newly enacting the existing laws has emerged. When modifying the legal system to meet the changes, however, cautious prediction and consideration must precede. As noted above, nations worldwide are making cautious efforts to solve related issues and react to such developments. The implications based on the discussion are as follows.

First, regulations on risk factors that can accompany the development of ICT-based converged service must be prepared in advance. Especially, because converged service makes everything to be connected to each other via network, a loophole in the management of security and protection of personal information can lead to a bigger harm. Thus, relevant regulations and laws must be thoroughly established and carried out.

⁴ S. W. Jee (2009), "Internet-based service regulatory trends overseas." P. 142.

Secondly, the laws must consider the harmony and balance between traditional types of services and converged services. How existing broadcasting and communication services would compete with, as well as whether various types of relevant regulations would interact with the new converged services must be examined. Therefore, new regulations on converged service or modifications on existing regulations on traditional service should reflect in-depth consideration of newly modified competitive relationships and subsequent ripple effect.

Third, new regulations must leave a room for innovation. Individual enactment of a new law whenever a new type of service appears will likely hinder the possibility of innovations. Accordingly, rather than creating individual laws for different types of services, it would be better for the promotion policy of a nation and balancing act to leave a room for innovation by constructing a general legal system that can encompass ICT-based converged service.

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VERTICAL RESPONSE OF A HEREDITARY DEFORMABLE SYSTEM

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Abstract: *An investigation of a viscoelastic material damping effect is studied on an example of plenum air-cushion craft model. A numerical investigation was conducted to determine the vertical response characteristic of an open plenum air-cushion structure. The pure vertical motion of an air-cushion structure is investigated using a non-linear mathematical model; this incorporates a simple*

model to account hereditary deformable characteristic of the material.

Key words: *Viscoelasticity, hereditary deformable, air-cushion, integro-differential equation*

Introduction

The term "Viscoelastic" material has quite a broad meaning. For example, in the literature [1 to 6] there